AN

EXPERIMENTAL INQUIRY

INTO

THE PROPERTIES OF

OPIUM,

AND ITS

EFFECTS

ON

LIVING SUBJECTS:

WITH OBSERVATIONS ON ITS

HISTORY, PREPARATIONS and USES.

BEING THE

DISPUTATION which gained the HARVEIAN PRIZE for the Year 1785.

BY JOHN LEIGH, M.D.

Quæ priores nondum comperta, eloquentiâ percoluere, rerum fide tradentur. TACITUS.

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THIS TREATISE IS HUMBLY INSCRIBED

TO

GEORGE WASHINGTON, Esq.

A MAN EQUALLY REVERED

BY THE FRIENDS AND FOES OF HIS COUNTRY;

AND WHOSE CHARACTER WILL,

WITH UNRIVALLED LUSTRE,

BE TRANSMITTED TO THE

LATEST AGES OF POSTERITY,

FOR CONSUMMATE CONDUCT AND COURAGE,

PUBLIC AND PRIVATE VIRTUE.

EDINBURGH,
May 15. 1786.

INTRODUCTION.

THE difficulties which every young author muſt encounter when he ſolicits, for the firſt time, the attention of the public, are ſufficient to damp the ardour even of the moſt active genius; and muſt of neceſſity appear doubly formidable to the man who is diffident of himſelf.

ſelf. Criticiſm lies in wait for the diſcovery of error; Satire prepares its ſhafts; the merits of the work, if it can boaſt of any merit, are frequently overlooked, and its defects ſedulouſly held forth to the eyes of the world. Such is generally the fate of a firſt production, when it is brought forward to public view recommended by no authority, and ſupported by no ſanction which may command reſpect.

THE author of the preſent Treatiſe is not ſo vain as to imagine that he poſſeſſes any thing in himſelf which is capable of ſhielding him from theſe attacks. And had he nothing to ſupport him but his own authority, he never would have ventured to appear before the awful tribunal of the public. But he has the happineſs to find, that he poſſeſſes ſomething more ſolid to depend upon than this frail ſupport. His Treatiſe has obtained the patronage

tronage of the *Harveian Society;* the members of which have repeatedly diſtinguiſhed themſelves by their eminent abilities. The approbation of this reſpectable ſociety has encouraged him to give to the world what otherwiſe his diffidence would have led him to with-hold; and he flatters himſelf, that his Treatiſe will be received with that candour and indulgence to which a firſt performance has a peculiar claim. Having thus made his apology, he ſhall detain the reader no longer than while he deſcribes the method by which he has conducted himſelf in this work. As this Treatiſe was originally written in the form of a diſſertation for the Harveian Society, (to which many additions will now be made), it was incumbent upon the author to adopt that method which a long eſtabliſhed cuſtom had rendered common. For this reaſon the work will be introduced by a ſhort hiſtory of opium.

UPON this ſubject very few original obſervations can be expected; the only demand that can be made on the author is, to collect and arrange with accuracy thoſe opinions which are beſt eſtabliſhed, and which convey the greateſt degree of information. As the author's endeavours to effect this have been exerted to the utmoſt, he hopes they will not be found to have been altogether fruitleſs.

LINNÆUS has placed the Papaver among his Polyandria Monogynia, and deſcribes ſeveral ſpecies; but his Papaver Somniferum ſeems to be generally conſidered as that from which the opium is prepared.

THESE plants grow in great plenty in the fields and gardens of Perſia, Egypt, and other provinces of Aſia; they have not hitherto been much cultivated in Europe,

rope, though they are often found in gardens.

BOTANICAL writers have deſcribed this plant in the following manner: "It has "oblong ſlightly indented leaves and "roundiſh ſtalks, divided into a few "branches, each of which is terminated "by a large tetrapetalous flower of a "whitiſh appearance, ſet in a two-leaved "cup that falls off as the flower opens; "the flower itſelf likewiſe ſoon falls, lea-"ving a ſmooth roundiſh head or capſule, "covered with a radiated crown, and con-"taining a number of ſmooth roundiſh "white ſeeds: It is annual, and flowers "from June to near the end of ſum-"mer."

IN Chardin's Travels (an author of the greateſt accuracy and moſt extenſive obſervation) we find the following deſcrip-

"This plant is four feet high; its leaves "very white: it is ripe in the month of "June; about which time the juice is ex- "tracted from the heads."

IN Raynal's Hiſtory of the Eaſt Indies, a different deſcription is given of this plant. This author ſays, "That this plant "has oblong and ſinuate leaves of a ſea- "green colour, alternately diſpoſed upon "a ſmooth ſtem with very few branches, "and three feet high. Each branch is al- "moſt naked, terminating by a ſingle "flower, rather large, compoſed of a calix "with two leaves, four white or roſe- "coloured petals, and a great number of "ſtamina placed under the piſtil, which "they ſurround. The piſtil grows into a "large round ſeed-veſſel, ornamented with "a radiated crown, and filled with a pro- "digious number of round, white, and "oily ſeeds."

IT is not wonderful that, at a period when truth and reaſon were obſcured by ſuperſtition, and when inveſtigation was ſmothered by ignorance, even the hiſtory of a remedy ſo generally uſed as opium ſhould have produced many diſputes: Thus, in the works of the more ancient writers, we find that this ſubject gave riſe to a conteſt in which many were engaged.

THE ſpecies of poppy from which the opium was prepared, appears firſt to have opened this field of contention; and on this point great names have contended againſt each other. Pliny, who appears to be an author of great information, aſſerts with much confidence, that opium is procured principally from the Papaver Nigrum. Dalecampus alſo ſupports this opinion with all the warmth natural to a mind conſcious of the truth of its aſſer-

tions; but Garcias and Kempfer, who were both in Egypt, queſtion the validity of theſe opinions, and attempt to overthrow them, by telling us, that they had frequently witneſſed the operation for extracting the opium, and that the white poppy alone was uſed. Diſputes of this nature might be uſeful and amuſing in an age when diſcoveries firſt began to dawn upon mankind; but at preſent they would be fruitleſs, as very recent experiments prove, that the opium prepared either from the black or white poppy is equally good. As, however, the white poppy has by much the largeſt head, and is found to afford the greateſt quantity of juice, there can be little doubt that the makers of opium will prefer this.

THE next ſubject that engaged the attention of the ancients, was by far the moſt important and intereſting: this reſpected

ſpected the manner of preparing opium. We ſhall here find, that authors of great and eſtabliſhed repute have entered the liſts, and encountered each other with ſo much warmth, that an appeal to their works will only add to the confuſion. Lemery, Alpinus, Savary, and others, have made many attempts to prove that the opium of our ſhops is nothing more than the Meconium of the Egyptians, which they prepared from the heads and leaves of poppies. This opinion has received additional force from the obſervations of Mr Condamine, who expreſſes himſelf in the following words: "I am aſſured by thoſe "who are well informed, that the opium "of the ſhops is all an extract of the de-"coction of the poppies." Beleonius alſo, who travelled for the ſpace of two years in Egypt, mentions many circumſtances in ſupport of the opinion of Condamine; but when we examine the works of thoſe who

wrote

wrote about the ſame time, and others who followed, there will appear many arguments ſufficiently ſtrong to ſhake, if not to overthrow, the opinions juſt now mentioned. Garcias, Mandelſlo, Tavernier, Kempfer, and others of equal eminence, have inveſtigated this point with the greateſt candour; and from their determinations we are led to conclude, that the opium of our ſhops, as well as that of the Egyptians, was procured only from the juice of the poppy-heads by inciſion. In this undetermined ſtate the diſpute remained, when there appeared one *, who, more attached to facts than ſpeculations, entered willingly into the field of experiment, and after much labour elucidated and firmly eſtabliſhed the truth. To this adventurer are we then indebted for the diſcovery which

* Dr Alſton.

which proves that opium is the juice of the poppy procured by inciſion alone.

WE are told, that in the province of Bahar in the Eaſt Indies, the poppy-ſeeds are ſown in the months of October and November, at about eight inches diſtance, and well watered till the plants are about half a foot high, when a compoſt of dung, nitrous earth, and aſhes, is ſpread over the areas; and a little before the flowers appear, they are again watered profuſely till the capſules are half grown, at which time the opium is collected; for when fully ripe, they yield but little juice: two longitudinal inciſions from below upwards, without penetrating the cavity, are made at ſun-ſet for three or four ſucceſſive evenings; in the morning the juice is ſcraped off with an iron ſcoop, and worked in an iron pot in the ſun's heat till it is of a conſiſtence to be formed into thick

cakes

cakes of about four pounds weight; these are covered over with the leaves of poppy, tobacco, or some other vegetable, to prevent their sticking together, and in this situation they are dried.

CHARDIN has given us the following account: "The poppy is ripe in the month "of June, at which time they extract the "juice from it; they slice it in the head; and "the Persians, by way of superstition, make "twelve slices in memory of the twelve "imans, three incisions one by another all "at the same time, with a little brill that "has three edges like the teeth of a comb; "there comes out a thick viscous juice, "which they collect at the dawn of day."

IN Raynal's History of the East Indies we find these observations: "When the "poppy is full of sap, and that the head of "it begins to swell, one or more incisions

"are made into it; from whence diſtil "ſome drops of the milky liquor contain-"ed within, which is left to congeal, and "is afterwards gathered. This operation "is repeated three times, but the produce "gradually diminiſhes in quantity, nor is "it of ſo good a quality. When the opi-"um is gathered, it is moiſtened and "kneaded with water or honey till it ac-"quires the conſiſtence, viſcidity, and "gloſſineſs of pitch, when it is well prepa-"pared, and is then made into cakes. That "kind is moſt in eſteem which is rather "ſoft and yields to the touch, is inflamma-"ble, of a blackiſh brown colour, and has "a ſtrong fetid ſmell; on the contrary, "that which is dry, friable, burnt, and "mixed with earth and ſand, is to be "thrown away."

THE opium prepared about Thebes, hence called the *Thebaic opium*, has been ge-

generally eſteemed the moſt pure; but Condamine diſputes the propriety of this common opinion. Thus, when mentioning "that the greateſt part of the opium "ſold at Conſtantinople is brought from "Natolia, he obſerves, that it grows in "great plenty in the territorry of Thebes "in Egypt; but even there the Natolian is "preferred, and ſells for double the price "of that made in the country." Chardin expreſſes himſelf in the following words on this ſubject: "The beſt *apoum*, as call-"ed by the ancients, hence our term *opi-"um*, is made in the canton of Lingar, "ſix leagues from Iſpahan, where the "fields are covered with poppies: There "are ſome who hold the opium of Caze-"ron in ſtill greater eſteem than that at "Iſpahan; ſaying, that the opium of the "latter produces crudities in the ſtomach, "while the other does not." Though diſtinctions of this kind can afford no real

utility at the preſent day, ſtill it is the duty of an author to correct, as far as information admits, every fallacious opinion which may have prevailed.

No writer has yet offered to the world any ſatisfactory account of the manner in which this valuable remedy, or its virtues, were firſt diſcovered; hence the imaginations of many have been buſily ſet to work, and a variety of fruitleſs conjectures brought forth to fill up this hiſtorical chaſm. Some ſay that it was firſt diſcovered by a Grecian, who, being compelled one night to take ſhelter under a tree where a number of poppies grew, found himſelf ſo diſpoſed to ſleep as not to be able to riſe in the morning. Others attempt to prove that it was diſcovered by an Egyptian, who, labouring under ſome complaint, was adviſed to have recourſe to the uſe of vegetables in form of decoction;

that

that by chance the poppy was uſed, and thus its effects became known.

IT is not ſtrange, that at this period of darkneſs even theſe fanciful conjectures ſhould have given riſe to a permanent diſpute; and hence we find that this alone was the cauſe of a conteſt, in ſupport of which many volumes have been written. Some, anxious to beſtow on the Egyptians the merit of this important diſcovery, and having no juſt grounds to ſupport their reaſons, have brought forth a variety of arguments, which are either taken from the works of poets (as Homer* and others), or which owe their birth to fancy.

THOUGH

* It is certain that Homer deſcribes, in the fourth Book of the Odyſſey, a drug which appears to poſſeſs all the qualities of opium, and which *Helen* is ſaid to have received from the wife of Thone the Egyptian. The Poet alſo deſcribes Egypt, in the ſame paſſage, as abounding at that period in ſkilful phyſicians. But from this we can hardly infer any regular uſe of opium as a medicine.

THOUGH it may be difficult to advance an opinion on this ſubject founded on truth and certainty, ſtill there are ſome circumſtances which will enable us to form a plauſible conjecture. As Hippocrates was the firſt who recommended opium to be uſed internally, it is highly probable that its properties were diſcovered about that time and in his country. This conjecture receives additional ſtrength from the opinion of Diagoras, who lived about the ſame time with Hippocrates. This phyſician is ſaid to have forbid the uſe of this remedy, becauſe it dimmed the ſight, and produced a great diſpoſition to ſleep. From theſe circumſtances it is reaſonable to conclude, that at this period the virtues of opium muſt have made their firſt appearance. Soon after this, attempts were made to inveſtigate the properties of this remedy, and its effects on living ſubjects. Things ſeem to have run the ſame

courſe in the Eaſt. Thus Chardin informs us how opium firſt began to be applied in Perſia for the cure of diſeaſes. "There was," ſays he, "a ſuperior of "Iſpahan, called Father Angé of St Jo- "ſeph, a man ſkilled in medicine, who, "anxious to underſtand the effects of "opium, took a pill of it, and then made "its operation known to the world."

NOTWITHSTANDING theſe very important diſcoveries, ſome conſiderable time elapſed before opium was freely uſed; and it is ſaid that Heraclides of Tarentum was the firſt who eſtabliſhed its reputation. And now the happy moment arrived when the benefits of ſo valuable a remedy were no longer to remain confined by the fetters of ignorance, but, like the light of day, to be diffuſed throughout the different parts of the world; and thus have they received thoſe juſt encomiums ſo liberally be-

beſtowed by many Arabian *, German †, and Engliſh ‡ writers. And thus far of the hiſtory of opium. We now proceed to the ſecond branch of our ſubject, which is to deſcribe its ſenſible qualities.

OPIUM (the inſpiſſated juice of the poppy) is of a ſolid conſiſtence; yet ſomewhat ſoftiſh and tenacious, of a peculiar faintiſh diſagreeable ſmell; to the taſte it is at firſt nauſeous and bitter, but ſoon becomes acrid and warm. In the maſs it is of a dark reddiſh brown colour, and when reduced into powder yellow; it is ſaid to poſſeſs a gum-reſin, an eſſential oil, a ſalt and earthy matter. To aſcertain the truth of this opinion the following experiments were made; but before theſe are related, it ſeems proper to obſerve,

* Rhaſes, Avicenna, and Avenzoar.

† Sennertus, Wedelius, and Ludovicus.

‡ Sydenham, and many others.

that as it was my duty to analiſe the component parts of opium with the greateſt accuracy, it became neceſſary to inſtitute a number of experiments; which are better calculated, perhaps, to effect that end, than to afford entertainment to the reader.

EXPE-

EXPERIMENTS

ON

OPIUM.

FIRST CLASS.

EXPERIMENT I.

TO one ounce of the common crude opium of the ſhops I added a quantity of diſtilled water; the opium was then ſuffered to macerate for three days, during which time it was very often agitated:

freſh water was added, and the agitation continued ſo long as the opium communicated any colour to the water.

EXPER. II.

THE whole of the above ſolution was now filtered; and that which paſſed thro' the paper, which I ſuppoſed to be the gummy part, was evaporated by a very gentle heat down to the conſiſtence of an extract: this was put into a cool place; and when perfectly dry, weighed: the quantity was found to anſwer to the following Table of the different proportions.

EXPER. III.

To that part of the opium which remained after the filtration of Exper. II. and which could not be acted upon by water, I added a quantity of alcohol, and ſuf-

ſuffered it to macerate two days, during which it was repeatedly agitated in the veſſel; the liquor was then gently poured off, freſh alcohol added, and the whole rubbed in a mortar ſo long as the alcohol had any action on the opium: it was then filtered.

EXPER. IV.

The ſolution which paſſed through the filtering paper, and which I ſuppoſed to be the reſinous part of the opium, as it had been taken up by the alcohol, was evaporated by a very gentle heat down to the conſiſtence of an extract, which was made dry and weighed.

EXPER. V.

After the filter of Exper. III. there remained a conſiderable reſiduum, which

I have taken the liberty to call Feculent Matter, becauſe it was found, as will be hereafter proved, to poſſeſs no ſenſible properties: this matter was made dry by a gentle heat; which, with the other different parts, was as follows:

Different parts of opium, and the quantities of each, anſwering to the firſt Claſs of Experiments.

Quantity of reſin ʒi & ℈i.
Gum ʒiij & grs. 50.
Feculent matter ʒi. grs. 6.

The reaſons which induced me to inſtitute theſe experiments muſt appear obvious; my deſign was to ſeparate the gummy and reſinous parts of the opium from each other: with this view I was led to uſe diſtilled water, which is well known to be the beſt ſolvent for gums. The ſame reaſons would naturally lead me, after diſſolving the gum, to make uſe of a menſtruum which might act upon the

the reſin; for this purpoſe I had recourſe to alcohol, which is found to be the moſt powerful ſolvent for all reſinous matter. Though theſe different menſtrua act upon the gum and reſin perfectly when in a pure and ſeparate ſtate, I yet doubted whether theſe experiments alone would anſwer my purpoſe fully, as it appeared very probable that the gum, when intimately combined with the reſin, might render the latter partially ſoluble in water; and thus alſo with reſpect to the ſolubility of the gum by alcohol when intimately combined with the reſin. For theſe reaſons I thought it dangerous to confide too implicitly in one ſet of experiments, and that it would be more adviſable to introduce others, by which I ſhould avoid every difficulty, and alſo remove my own doubts. With this view I inſtituted the following, which I hope have fully anſwered my expectations. It ſeems proper to obſerve here,

here, that wherever in my experiments I have mentioned opium ſimply, without any other diſtinction, I mean the common crude opium of the ſhops.

As the following experiments were inſtituted with the ſame view and for the ſame reaſons as the preceding (viz. to ſeparate the different parts of opium), it will be unneceſſary to make any further obſervations reſpecting each of them: The reaſons which induced me to take the liberty of uſing the term Feculent Matter, mentioned in Exper. V. will be more particularly explained when I come to examine the different parts of opium.

S E-

SECOND CLASS.

EXPER. VI.

One ounce of opium was cut into very ſmall pieces, a quantity of alcohol was added, and it macerated three days, during which it was repeatedly agitated; the liquor was then gently poured off, freſh added, and the agitation continued ſo long as the opium communicated to it any colour: I then filtered the whole; and the ſolution which paſſed the filter was evaporated by a very gentle heat down to the conſiſtence of an extract, which was then dried and prepared in the ſame manner as in preceding experiments.

EXPER. VII.

To the opium which remained after this filtration, and which I ſuppoſed to be the gummy

gummy part, I added a quantity of diſtilled water, and agitated it in a mortar with a peſtle; freſh water was added, and the agitation continued as long as any colour was communicated to the water; the whole ſolution was now filtered, and that which paſſed through the paper evaporated by a very gentle heat down to the conſiſtence of an extract, which was dried and weighed: the quantity is mentioned in the following table.

EXPER. VIII.

After this filtration, there remained a conſiderable reſiduum, to which I have already given the name of Feculent Matter; this was dried, weighed, and found with the other different parts of the opium as follows.

Different parts of opium, and quantity

of

of each, anſwering to Second Claſs of Experiments.

Qantity of reſin	ʒi. and ℈i
Gum	ʒiij. and grs 6
Fec. matter,	ʒi. and grs 10

THIRD

THIRD CLASS.

EXPER. IX.

I ADDED to one ounce of opium lb. ij. of diſtilled water; then put the whole into an open veſſel, and applied to it one hundred degrees of heat by thermometer: It remained in this ſituation twenty-four hours, was then put by till cool, when I filtered it.

EXPER. X.

THE ſolution which paſſed through the filtering paper was now evaporated by a very

very gentle heat down to the consistence of an extract, then dried, and its quantity ascertained.

EXPER. XI.

To the opium which remained on the filter of Exper. IX. I added a quantity of alcohol, and rubbed it in a mortar for a considerable time; fresh alcohol was added, and the rubbing continued so long as any colour was communicated by the opium; the whole was then filtered, and the solution evaporated and prepared in the same manner as mentioned in last Experment.

EXPER. XII.

THERE remained after this filtration a considerable quantity of what I have

called Feculent Matter: this was dried, weighed, and found as follows.

Table of Third Clafs of Experiments.

Quantity of refin	3i. and grs 15
Gum	3iij. and grs 30
Fec. matter,	3i. and grs 15

FOURTH

FOURTH CLASS.

EXPER. XIII.

AFTER cutting one ounce of opium into very ſmall pieces, I added to it a quantity of diſtilled water, and rubbed it in a mortar for ſome conſiderable time; the water was then gently poured off, and freſh added; agitation with the peſtle was alſo continued; this was repeated ſo long as the opium gave any colour to the water: the ſolution was then filtered, and evaporated by a gentle heat down to the conſiſtence of a thick ſyrup.

EXPER. XIV.

To this ſyrupy conſiſtence I added a

conſiderable quantity of alcohol, and ſuffered it to ſtand ſeveral hours; the alcohol was then gently poured off.

This method was adopted, becauſe I apprehended that the diſtilled water had taken up ſome of the reſinous part of the opium with the gum. By the addition of alcohol in a very conſiderable quantity, I was certain that any part of the reſin which might be contained in this ſyrupy conſiſtence with the gum would be taken up inſtantly, and the gum left pure at the bottom. When I examined the alcohol which was poured off, it was found to contain ſome reſin, the quantity of which was afterwards aſcertained by the proceſs of evaporation.

This proves evidently, that although reſin, when in a pure and ſeparate ſtate, is inſoluble in water; yet when intimately com-

combined with gummy matter, is rendered partially ſoluble by that menſtruum.

EXPER. XV.

To the opium which remained inſoluble in water after the filtration of Experiment XIII. I added a quantity of alcohol, and then rubbed the whole for a conſiderable time in a mortar: this was poured off, freſh alcohol added, and the agitation continued ſo long as the alcohol received any colour from the opium.—The whole was then filtered, and evaporated by a gentle heat down to the conſiſtence of a thick ſyrup.

EXPER. XVI.

To this ſyrupy conſiſtence I added a very conſiderable quantity of diſtilled water; it was then ſuffered to ſtand ſe-

veral hours, when the water was poured off. The extract which remained at the bottom of the veſſel was made dry and weighed.

This method was adopted with views ſimilar to thoſe of Exper. XIV. Finding that the reſin had been rendered partially ſoluble in water by means of the gum with which it was combined, I was naturally led to ſuſpect that the ſame would take place with the gum when intimately combined with the reſin: in this conjecture I was by no means deceived; for by examining the water which I had poured off from the reſionus matter, it was found to have taken up a conſiderable quantity of gum which had been acted upon by the alcohol.

This muſt prove inconteſtably, that both gummy and reſinous matters, when intimately combined, render each other capable

ble of being acted upon by menſtrua, which have no effect upon them when in a pure and ſeparate ſtate.

EXPER. XVII.

AFTER the filtration of Exper. XV. there remained a quantity of feculent matter: This was made dry; and its quantity with the other different parts of the opium found to be as follows.

Table anſwering to Fourth Claſs of Experiments.

Quantity of reſin,	ʒi. and ϑi.
Gum,	ʒiv. and grs. 20.
Fec. matter,	ʒi.

The whole of theſe experiments were frequently repeated; but I muſt confeſs that they did not exactly agree: the laſt

claſs ſeems to merit the greateſt attention; for though, when repeated, they did not perfectly correſpond with the firſt, yet I found in them the leaſt variation. Upon examining the different quantities found in the ſeveral claſſes of experiments, it is clear a loſs has been ſuſtained in ſome of them; but it muſt be obſerved, that tho' it is impoſſible to avoid ſome loſs in experiments of this nature, ſtill we ſhall find it leſs on the preſent occaſion than appears at firſt view. The opium which I uſed in theſe experiments had never received any heat, which I found by trial would free it, even applied in a moderate degree, of a very conſiderable part of its moiſture, and conſequently leſſen its weight. One ounce of the common opium of the ſhops will, by expoſure to a moderate heat, be deprived of one drachm of its weight.

The reaſons which led me to uſe the pro-

proceſs of evaporation muſt appear evident, as this was the only ſecure method by which I could reduce the different ſolutions to a ſolid ſtate, and ſo aſcertain their different quantities.

As I intended to make ſome experiments upon the different parts of the opium when they were perfectly ſeparated, I avoided applying ſuch a degree of heat as might have deprived them of any of their active properties. Having thus fully accompliſhed my views, by procuring in a ſeparate ſtate theſe different parts, I proceeded to examine each ſeparately, as will appear from the following experiments.

EXPER. XVIII.

TO a ſmall quantity of the reſinous part of opium, procured by the Fourth Claſs of Experiments, after being diſſol-

ved in alcohol, I added a ſmall quantity of chalybeate water; it immediately ſtruck a deep black colour, which increaſed conſiderably by ſtanding two days. It may be proper here to obſerve, that whenever I made uſe of my chalybeate water, it was ever of the ſame ſtrength, viz. ten grains of ſal mart. to one ounce of common diſtilled water.

EXPER. XIX.

TO the ſame quantity of pure gum as of reſin uſed in laſt experiment, when diſſolved, I added the ſame quantity of my chalybeate; it ſtruck a black colour, which increaſed by ſtanding two days, but did not equal that produced in the reſinous ſolution This muſt lead us to ſuppoſe, that the principle of aſtringency reſts in the reſinous part of the opium in a greater degree than in the gum; ſtill it is evi-

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dent from this experiment, that the gum alſo poſſeſſes ſomething of the ſame principle.

EXPER. XX.

TO a quaintity of the feculent matter I added alcohol, and then rubbed it in a mortar for ſome conſiderable time; but no colour was communicated to the alcohol, nor had it any effect whatever on the feculent matter. To more of this matter was then added a quantity of diſtilled water, with which it was rubbed in a mortar ſome conſiderable time, but no colour was communicated to the water; the water was then poured off, the matter dried, and found to have loſt nothing in weight.

EXPER. XXI.

I THEN added to a quantity of this feculent matter boiling water, and ſuffered it to ſtand ſeveral hours; no change whatever took place in the matter: By the addition of the boiling water a ſmall quantity of earthy matter was ſet at liberty, which fell to the bottom of the veſſel. When applied to the organs of taſte and ſmell, this feculent matter communicated no ſenſible properties whatever. Theſe experiments prove, that little dependence ſhould be placed in the common crude opium of the ſhops, as it contains more than one-eighth part of inactive matter: They alſo point out the neceſſity of adopting ſome mode by which the opium of the ſhops may be freed from its impurities. For this purpoſe the London Diſpenſatory has recommended the method

of

of ſtraining the opium; but even this will not anſwer the end effectually, as will appear from the following experiments.

EXPER. XXII.

HAVING procured two drachms of the pureſt ſtrained opium of the ſhops, I added to it the ſame proportion of proof ſpirits and water as ordered by the Pharmacopœia for making Tinct. Theb. It was then ſuffered to ſtand near a ſtove, where the temperature was ninety-five degrees by thermometer, for three days; during which it was repeatedly agitated: It was then filtered, the reſidium dried, and found to amount to ten grains in weight.

EXPER. XXIII.

TO this reſiduum or feculent matter of the

the ſtrained opium I added the different menſtrua uſed in Exper. XX. and XXI. but it was found inſoluble in either: When applied to the organs of taſte or ſmell, it communicated no ſenſible activity.

From theſe circumſtances it appears very evident, that ſtraining the opium does not purify it ſufficiently: For, independent of the inactive matter which is found to remain in the opium after being ſtrained, it is reaſonable to ſuppoſe that the great degree of heat made uſe of in this proceſs cannot fail to diminiſh its active properties conſiderably. The effects of heat on opium will, however, be pointed out more fully in a ſucceeding part of this work. Anxious to know the ſtrength of ſtrained opium, I gave a man in perfect health three grains of it, and remained with him till the operation was over:

Three days after, I gave the ſame man two grains of pure gum and reſin intimately combined, and found that the effects of the laſt doſe were conſiderably greater than the firſt.

The reſult of theſe experiments points out the propriety of ſearching for ſome other means, by which we may not only free the opium of its impurities, but at the ſame time avoid doing any injury to its active properties. For this purpoſe the following method ſeems moſt eligible:

To one ounce of the common opium of the ſhops add ſix ounces of ſpirit of wine diluted with as much water; let them digeſt in a gentle heat for four days, during which they ſhould be frequently agitated; then filter the whole, and evaporate the tincture by a very gentle heat down to the conſiſtence of an extract. By this method

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we ſhall get the opium in a pure ſtate. The menſtruum here recommended, is known to act powerfully both on the gum and reſin, which will be intimately combined by the proceſs of evaporation; and by filtering the tincture through paper we ſhall free it perfectly of the feculent matter. When we have opium in this pure ſtate, the phyſician, who is acquainted with its operation, will be enabled to form, as to its effects, a true opinion, and will alſo have ſome proſpect of certainty in the doſe which he may adminiſter.

EXPER. XXIV.

TO one ounce of opium, cut into ſmall pieces, I added lb.ij. of diſtilled water; the whole was rubbed in a mortar till the opium was diſſolved. I then put the ſolution into an alembic, applied a briſk heat, and drew off about half a pound of the

water. As this experiment was inſtituted with a view to procure the eſſential oil of the opium, a briſk heat was neceſſary. To the taſte this water was extremely pungent, and left a diſagreeable nauſea: To the ſmell it was ſtrongly narcotic. To a quantity of this water ſome of my chalybeate was added, but no change whatever was produced in its colour. I examined ſome of this water with a magnifying glaſs, but could not diſcover diſtinctly any globules of oil. I was then led to make ſuch experiments as would enable me to ſeparate the particles of oil (if it contained any) from the water, ſo as to make them viſible. It will be unneceſſary to mention all the methods adopted for this purpoſe, as I was diſappointed in many of them; ſhall therefore only relate ſuch as ſucceeded.

EXPER.

EXPER. XXV.

TO a ſmall quantity of this water, drawn off from the opium by diſtillation, was added a ſufficiency of ſoluble tartar to ſaturate it; after ſtanding twenty-four hours, I examined it with a magnifying-glaſs, and diſcovered evidently ſmall globules of oil floating on the top of the water. To the taſte theſe were extremely pungent, attended with a peculiar ſenſation, which is common to opium alone. I was induced to adopt this method for the following reaſons. Suppoſing that the water which I had drawn off, from its ſmell and taſte, poſſeſſed a quantity of oil, the particles of which might be ſo intimately combined with it as to render them inviſible, I thought it neceſſary to add ſuch a body as might unite with the water and ſet the oil at liberty: It is well known that wa-

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ter and ſoluble tartar have a great affinity; and thus we find, that as ſoon as the water was ſaturated the oil roſe to the top. It may be proper here to obſerve, that neither alcohol uor pure alkali would have anſwered this purpoſe; becauſe they have an attraction for oil as well as water.

This experiment clearly proves, that the conjectures which many writers upon opium have advanced reſpecting its eſſential oil were better founded than they ſuppoſed. Suppoſing, from the ſtrong ſmell and taſte of this water, that it contained moſt of the active properties of opium, I was anxious to know its effects upon the living ſubject. With ſome difficulty I prevailed on a healthy man to take fifteen drops of it; in a ſhort ſpace of time it began to operate, and brought on ſuch a vomiting as deterred me from making any further experiments of this nature.

EXPER. XXVI.

WITH the opium from which this water was drawn, I now performed the ſame experiments as uſed the in Fourth Claſs, and with the ſame views, viz. to ſeparate the different parts: When this was accompliſhed, the following experiments were made.

EXPER. XXVII.

TO a ſmall quantity of the reſin, when diſſolved in alcohol, I added ſome of my chalybeate water; after ſtanding ſome time, a faint blackiſh colour appeared, but by no means ſo great as found by the trial made upon the reſin when ſeparated without the application of heat *. From this we may very reaſonably conclude, that the aſtrin-

* Vid. Exper. XVIII.

aſtringent principle reſts in the eſſential oil; for Exper. XVIII. proves indubitably, that the reſin, before the application of heat, poſſeſſed a very conſiderable degree of aſtringency, which we now find it is deprived off; I ſuppoſe in conſequence of the eſſential oil being extracted.

I gave three grains of this reſin diſſolved in acohol to a young girl in perfect health, who had never been accuſtomed to the uſe of opium, and remained with her near two hours to examine its operation, but it produced no ſenſible effects. I then repeated the ſame experiment upon a young man in perfect health, but could never diſcover the ſmalleſt effects from the doſe; nor did either of the patients complain of any unuſual feelings. This would ſeem to prove, that moſt of the active properties of the opium are contained in its eſſential

oil; and that the reſin, when deprived of this, has little or no action on the ſyſtem.

EXPER. XXVIII.

HAVING diſſolved a quantity of the gum in water which was ſeparated from the reſin, as mentioned in Exper. XXVI. I added to it a ſmall quantity of my chalybeate; a black colour was immediately produced, as great as that nearly which appeared in Exper. XIX. This gum was extremely bitter to the taſte, but had nothing of an odorous ſmell. It ſeems rather difficult to account for the principle of aſtringency in the gum; perhaps it may have the power, notwithſtanding the application of heat, to retain a certain quantity of the eſſential oil, in which it is probable its aſtringency, as well as that of the reſin, may reſide.

I gave a girl, fifteen years of age, four grains of this gum; in about an hour ſhe began to complain of a great degree of drowſineſs, which continued to increaſe till ſhe went to her bed, where ſhe reſted very well through the night. I viſited her early the next morning, and found her in perfect health, nor had ſhe felt any of thoſe diſagreeable ſymptoms which commonly follow ſo large a doſe of opium. In about half an hour after the opium began to operate, her pulſe fell twelve ſtrokes in a minute. During the time of the operation ſhe informed me, that ſhe felt no other effects except a very great diſpoſition to ſleep.

To procure the ſalt ſaid to be contained in opium was the object which now engaged me; and as many experiments were inſtituted for this purpoſe which did not ſucceed, it will be ſufficient to relate

thoſe only by which I accompliſhed my views.

EXPER. XXIX.

TO half an ounce of opium I added one ounce of nitrous acid diluted with the ſame quantity of diſtilled water; the whole was then put into a retort, and agitated for ſome conſiderable time; red fumes ſoon began to appear, and flew off in conſiderable quantity: as ſoon as the whole of theſe paſſed over, I applied the flame of a ſmall lamp to the bottom of the retort for two hours; at the end of which time no air was diſcovered to fly off from the mixture: The whole was then poured into an open veſſel, two ounces of diſtilled water added, and they were agitated ſome conſiderable time; after which the ſolution was filtered.

EXPER. XXX.

THE ſolution thus filtered was put into an open flat veſſel, and evaporated by a very gentle heat down to about one half of its quantity; it was then placed in a cool ſituation, where it remained two days: At the end of this time I examined it, and found a conſiderable number of cryſtals were formed at the bottom and ſides of the veſſel, of the ſame figure, colour, and taſte, as thoſe procured from ſugar. Theſe cryſtals were gently waſhed, dried, weighed, and found to amount to forty grains. I am induced, however, to believe, that if this experiment was repeated with accuracy, a much greater quantity of ſalt might be obtained: As it was the nature or property of this ſalt which I principally wiſhed to inveſtigate, little reſpect was paid to its quantity. It now remains

to aſſign the reaſons which induced me to adopt this method. Having made a number of different experiments before, and finding myſelf baffled in the whole of them, I was led to believe that the opium contained ſome inflammable principle which, while it remained perfect, might prevent the ſalt from forming. This naturally cauſed me to uſe the nitrous acid; which, with the addition of heat, I ſuppoſed woud effectually deprive it of ſuch a property, if it poſſeſſed it. I ſtill thought it neceſſary after this proceſs to evaporate the mixture; by which I intended to free the ſolution perfectly of any part of the nitrous acid contained in it.

Deſirous to know the effects which this ſalt would produce on the living ſubject, I gave to a man in perfect health ten grains diſſolved in water, and remained with him two hours, but found it had no ſenſible operation.

Theſe

Theſe experiments muſt lead us to form one of the two following conjectures; viz. That this ſaline matter is either originally contained in the opium, combined with the inflammable principle, which being deſtroyed ſuffers the ſalt to form; or, that it is a new compound produced by ſome principle in the nitrous acid combining with ſome matter contained in the opium. Though it appears from the quantity of this ſalt which I gave to a man, and which had no effect, that it does not poſſeſs any of the active properties of the opium; yet this will not give ſuch ſtrength to the latter conjecture as may at firſt be ſuſpected; for when we conſider the nature of the proceſs adopted to deprive the opium of its inflammable principle, it is juſt to conclude, that the ſame was ſufficient to deſtroy its active properties, and conſequently that the ſalt could not contain any of them. I am induced to believe alſo,

alſo, that by the proceſs of evaporation the opium was freed wholly of the nitrous acid. Theſe circumſtances lead me to favour the firſt conjecture.

Suppoſing, from the ſimilarity in appearance, taſte, and colour between this ſalt and that produced from ſugar, that their properties were nearly the ſame, the following experiments were inſtituted,

EXPER. XXXI.

I DISSOLVED, in a ſmall quantity of roſe water, equal parts of the acid ſalts of tartar, ſugar, and opium ſeparately; to each of theſe were added a few drops of Goulard's tincture, which they all precipitated; to each was then added a ſmall quantity of diſtilled vinegar, which had no effect whatever: I next added a few drops of the nitrous acid, which immediately

diately rediſſolved the lead in all: ſo far theſe different acid ſalts agreed with each other.

EXPER. XXXII.

I THEN added to theſe three acid ſalts ſeparately an equal quantity of lime-water: the acid ſalts of ſugar and opium precipitated the lime, but the acid ſalt of tartar did not. This experiment was repeated ſeveral times, and found ever the ſame. From the reſult of this I am led to believe, that the acid ſalts of ſugar and opium poſſeſs properties ſimilar to each other: It is very evident that they differ very much from the acid ſalt of tartar; for when the lime-water was added, the acid ſalt of tartar did not precipitate it.

EXPER.

EXPER. XXXIII.

HAVING procured five phials of the ſame ſize, I put into each half an ounce of opium cut into very ſmall pieces; and then added five ounces of different menſtrua, viz. alcohol, white-wine, vinegar, rectified ſpirits and water equal parts, and common diſtilled water: they were then placed near a furnace, where the heat was about ninety-five degrees by thermometer: in this ſituation they remained for five days; during which they were carefully and repeatedly agitated; the ſolutions were then filtered ſeparately, and the different reſidua dried and weighed: the quantity of each is expreſſed in the following table.

Water left undiſſolved - -	grs 199
Vinegar - - -	128
Alcohol - - -	100
White wine - - -	90
Rectified ſpirits and water - -	88

Theſe

Theſe experiments were repeated, and found to differ from the firſt only in a few grains: hence we muſt conclude, that there is the greateſt propriety in uſing the rectified ſpirits and water as the beſt menſtruum for making our Theb. Tinct.

EXPER. XXXIV.

I MADE two ounces of opium into the conſiſtence of a paſte with common diſtilled water; the ſame quantity was alſo made with water impregnated with fixed air: they were placed in open veſſels near a ſtove, where the heat was ninety degrees by thermometer. In this ſituation they remained ſome conſiderable time before any change could be diſcovered in either: at length I found fermentation taking place in the one containing fixed air; ſome conſiderable time after this, a number of bubbles roſe in the other, and a ſmall quantity

tity of air aſcaped: this air I endeavoured to collect by means of a bladder which was confined over the mouth of the veſſel; but the quantity was ſo ſmall as to render the attempt fruitleſs: the opium was now dried, and the following experiments made.

EXPER. XXXV.

A SMALL quantity of each of the fermented ſubſtances was ſeparately diſſolved in equal parts of rectified ſpirits and water; I added then to them a few drops of my chalybeate water; each ſtruck a deep black colour equal to that found by the experiments made on opium that had not been expoſed to heat. To two patients I gave three grains each of this fermented opium; the doſe began to operate on one in thirty-five minutes, and produced a nauſea, headach, vertigo, and moſt of the other ſymptoms which commonly follow

ſuch a quantity of opium. The operation of the opium did not appear ſo ſoon in the other patient as common; but at length produced ſymptoms ſimilar to thoſe juſt mentioned. From theſe experiments I am induced to believe, that the opinions of thoſe who attempt to prove that opium is deprived of its dangerous properties by fermentation, muſt be erroneouſly founded. If the active properties of opium depend upon its eſſential oil (which I conceive we are led to believe from the experiments in a former part of this work), it clearly follows, that the moderate degree of heat neceſſary to produce fermentation, is by no means ſufficient to deprive it of this property. I was led to uſe the fixed air in theſe experiments with a view to diſcover its effects in the proceſs of fermentation, and alſo to ſee whether it produced any change in the aſtringency of the opium. From the circumſtances related,

lated, it will appear very evident, that the fixed air haſtened the fermentation; but no difference could be diſcovered in the aſtringency of the opium, as that appeared to be equally great in each.

PRE-

PREPARATIONS

OF

OPIUM.

THOUGH many of the preparations of opium that were introduced by the moſt ancient phyſicians are now thrown aſide as totally inefficacious; yet we find, that, led away either by blind prejudices or an uncommon attachment to former cuſtoms, ſome are ſtill retained, which will be found, by minute inveſtigation, to be uſeleſs--A variety of preparations have been introduced with a view to deprive the

opium of its dangerous properties, and alſo to render it palatable. The latter may perhaps be uſeful, but the former ſeems to merit little attention.

Opium Colatum, vel Extractum Thebaicum.

This preparation is highly recommended by the London Diſpenſatory, as the one in which we have opium in its pureſt ſtate. I truſt, however, I have proved by Exper. XXII. and XXIII. that it does not poſſeſs theſe advantages. I not only found that the ſtrained opium of the ſhops contained a conſiderable quantity of inactive matter, but alſo that its action was much injured by the great degree of heat uſed in the proceſs for preparing it.—Theſe reaſons lead me to believe, that it would be adviſable to throw aſide this formula alto-

altogether, and adopt the one recommended in EXPER. XXIII.

LAUDANUM LIQUIDUM, vel TINCTURA THEBAICA.

THIS preparation, highly recommended by the London Diſpenſatory, perhaps merits as much attention as any other; as the menſtruum uſed not only acts powerfully upon the opium, but renders it palatable: but even this elegant preparation has ſome inconveniences attending it; as the opium, with which it is ordered to be made, is found to contain much inactive matter, there can be no real certainty in the doſe. The Edinburgh Pharmacopœia has made ſome improvements in this formula, by increaſing the quantity of opium. When opium is to be adminiſtered in a fluid form, perhaps this will anſwer better than any other.

Elixir Paregoricum.

The Edinburgh and London formulæ here differ ſomewhat from each other. The London recommends rectified ſpirits of wine as the menſtruum, while the Edinburgh adviſes the vinous ſpirit of ſal ammon: this perhaps may be the moſt powerful menſtruum. The Edinburgh formula has alſo increaſed the quantity of the opium. From this laſt improvement I apprehend the greateſt advantages muſt ariſe: As the opium in this preparation is the principal ingredient on which we place our dependence, it is neceſſary to adminiſter it in ſuch a quantity as to enable it to produce its good effects. This preparation is ſaid to be uſeful, by allaying the tickling which provokes frequent coughing; and is ſuppoſed alſo to render reſpiration eaſy. The opium is ſaid to procure

a temporary relief from the ſymptoms, while the other ingredients tend to remove the cauſe, and prevent their return.

Pilulæ Saponaceæ. (*L.*)

This is a preparation which I am led to believe may be productive of ſome diſagreeable conſequences: Though the eſſence of lemons uſed may make it agreeable to the ſtomach, yet if the ſoap which the pills contain ſhould meet with an acid in the ſtomach, which muſt often happen, it would be immediately decompoſed, and perhaps produce diſagreeable effects.

Pilulæ è Styrace. (*L.*)

This preparation ſeems to have been intended to prevent the opium from acting ſpeedily: The ſtorax uſed, which is a reſinous ſubſtance, being difficult of ſolution,

may perhaps anſwer this purpoſe; but whether any benefits are ever to be expected from this formula, ſeems doubtful.

PILULÆ THEBAICÆ, vulgo PACIFICÆ. (*E.*)

THE Jamaica pepper, recommended as one of the ingredients in this formula, may perhaps be uſeful, by rendering the opium palatable: no medicinal virtues can be expected from any of the ingredients except the opium, as their quantities are too ſmall to enable them to produce any effects.

PULVIS è BOLO compoſitus cum OPIO.

IF any good effects were ever obſerved to follow the uſe of this preparation, I am induced to think that the opium is intitled to no part of the merit; becauſe its quantity

tity is ſo very ſmall, when compared with the other ingredients, as to render it incapable of producing any effects from its operation. It is ordered to be given in fluxes, and other diſeaſes where aſtringents are required.

Species è Scordio cum Opio. (*L.*)

This preparation is ſtuffed with a number of ingredients, among which opium is introduced, but in ſo ſmall a quantity, that we are denied the liberty of ſaying any ſalutary effects ariſe from its operation. We are told by ſome, that long experience has now eſtabliſhed the utility of this formula: if this opinion be juſt, I am inclined to think, that it is the operation of the other ingredients, and not that of opium, which renders it valuable.

Pulvis è Succino compositus. (*L.*)

Many of the ingredients formerly contained in this formula have been lately thrown aside as totally superfluous; and I am induced to think, if this reform had been more extensive, the preparation would then have been rendered as elegant, and clearly more valuable, as it even now contains many ingredients which can possess no medicinal virtues. Two scruples of this composition contain only one grain of opium. It is retained as an elegant astringent.

Electarium è Scordio vulgo Diascordium.

The Edinburgh Pharmacopœia has ordered this formula to be changed, and introduced one in its place under the name

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of Electarium Japonicum, which ſeems much more elegant and valuable; but even in this the quantity of opium is very ſmall, ten ſcruples of the electuary only containing one grain of the opium. This is conſidered as a moderately warm aſtringent and opiate.

Confectio Paulina. (*L.*)

In this the proportion of opium is one grain to thirty-two of the other ingredients. It is uſed as a warm opiate medicine. If this preparation has been found uſeful, perhaps the opium is intitled to the ſmalleſt ſhare of the merit, as its quantity is ſmall, and all the other ingredients of a warm and active nature.

Philo-

Philonium, Mithridatium, et Theriaca. (*L.*)

These three, together with the two laſt formulæ, are the only compoſitions now remaining of what have been called the Officinal Capitals. It is not a little wonderful, that the phyſicians of the preſent day ſhould ſuffer themſelves to be led ſo far by their attachments to ancient cuſtoms, as ſtill to retain among them the above formulæ. We find that the ancients introduced theſe as antidotes to ſecure them againſt the danger of poiſons; but when we are told by the light of the preſent day, that theſe poiſons of the ancients, as well as their antidotes, were only the offſprings of fancy, ſhall we even then ſuffer blind prejudice to lead us on to adhere to the ſame cuſtom? Though theſe formulæ contain many very active remedies,

yet

yet they are ſo curiouſly and promiſcuouſly intermixed, and the operations of many of them ſo very different, that we cannot expect much benefit from any of them; and clearly the ſmalleſt muſt be attributed to the opium.

Linimentum Anodynum.

This liniment, compoſed of camphor and opium, in very conſiderable quantities, is ſaid to be an anodyne and diſcutient. It is recommended highly to allay pains in ſtrained limbs, and many other topical affections.

Trochisci Bechici cum Opio.

These troches are recommended as very efficacious in tickling coughs; they are thought to allay the irritation of the fauces, which tends much to render the cough

trouble-

troubleſome *. Although moſt of the formulæ I have mentioned are ſtill employed, and much reſpected by ſome phyſicians, yet I am led to think, that we may reap moſt of the advantages of opium from a preparation of the following nature:

℞ opii pur. gr. j.
Extract. Glycyrrh. grs. ij.
M. fiat Pil.

When the opium is given in this manner, it ſeldom proves diſagreeable to the ſtomach; and the liquorice with which it is mixed renders the pill eaſily ſoluble: Another very ſingular advantage in this preration

* Opium is often united and adminiſtered with other remedies, to prevent their operation on the inteſtines; as with bark, mercury, &c.

paration is, that we may ever be certain of the quantity of opium given *.

* Dr Duncan recommends the following formula:

℞ Opii ʒi.
Mic. pan. ʒfs.
Syr. ſimp. q. ſ. fiat maſſa divid. in pilulas granorum quinque.

Though this appears to be a very convenient and uſeful formula, ſtill I muſt hope to be pardoned when I ſay that ſome inconveniences may attend it: It appears to me, that the bread with which the opium is ordered to be mixed will be apt to loſe its moiſture; and thus becoming hard and dry, muſt be diſſolved with difficulty; for this reaſon I took the liberty to recommend the extract of liquorice, which retains its moiſture, and promotes the ſolubility of the opium.

EXPE-

EXPERIMENTS

ON

LIVING SUBJECTS.

EXPERIMENT I.

I DISSOLVED ten grains of the common opium of the ſhops in one ounce of water, and then poured a conſiderable quantity of the ſolution into the eyes of three puppies three weeks old; the muſcles of the eyes were ſoon thrown into motion, and the puppies expreſſed much pain by their actions. As ſoon as they were quiet,

the eyes of each were attentively examined: there appeared a little redneſs in the tunica conjunctiva of one, which remained viſible but a ſhort time; the others were found in a natural ſtate.

EXPER. II.

SEVERAL drops of the ſolution uſed in laſt Experiment were poured into my own eye; the muſcles were inſtantly thrown into a violent motion, and I felt a moſt excruciating pain for ſeven minutes, which was followed by a copious diſcharge of tears: as ſoon as the eye became quiet, I had it examined by my friend *, who witneſſed the Experiment; and he conceived that an unuſual degree of redneſs was produced; but this was ſlight, and ſoon diſappeared. From the violence of the pain which the ſolution cauſed, I feared ſome injury

* Dr Ramſay from Virginia.

injury would follow; but theſe apprehenſions were groundleſs.

EXPER. III.

ONE drachm of opium was diſſolved in one ounce of water, and ſome of the ſolution thrown into the eyes of the three puppies mentioned in Experiment I. The muſcles of each were thrown into a violent motion, which continued for ſeven minutes: as ſoon as they were quiet, I examined the eyes of each, and diſcovered ſome little redneſs in the whole; but this was ſlighter than I expected from the violence of the actions produced by the ſolution. A large quantity of fluid was obſerved to flow from their eyes after the motions ceaſed.

EXPER.

EXPER. IV.

A QUANTITY of the ſolution laſt uſed was placed near a ſtove where the heat was eighty-five degrees by thermometer; I then poured ſeveral drops of it into the eye of a dog—The muſcles were inſtantly thrown into a motion, which appeared to be much more violent than that produced by the ſolution in a cold ſtate, and continued much longer: when the dog became quiet, I examined the eye, and found a very conſiderable degree of redneſs in the tunica conjunctiva, which remained viſible ſome conſiderable time, attended with a copious diſcharge of fluid.

EXPER. V.

TWENTY drops of this warm ſolution were poured into one of the eyes of a rab-

bit, and into the other the ſame quantity of the ſolution in a cold ſtate; the eye into which the warm ſolution was poured became much ſooner diſturbed than the other, the action was more violent, and continued much longer. When they were quiet, I examined each; and found the one to which the warm ſolution had been applied conſiderably inflamed; the other eye appeared much more red than natural. I endeavoured to diſcover the length of time the redneſs might continue in each; and found, that that produced by the warm ſolution diſappeared in about half an hour, the other only remained viſible fifteen minutes. From this it appears, that a moderate degree of heat added to opium increaſes its action conſiderably, and cauſes its effects to be produced much ſooner than when in a cold ſtate. To ſatisfy myſelf fully, whether this difference aroſe from the heat increaſing the active proper-

ties

ties of opium or from the warmth of the ſolution only, I applied the ſame degree of heat to ſome water, and then poured a conſiderable quantity of it into the eye of a dog; the animal appeared at firſt a little uneaſy, but this was momentary: when the eye was examined, no preternatural redneſs could be ſeen.

EXPER. VI.

I LAID bare the fibres of the glutei muſcles of a rabbit, and then poured on them a conſiderable quantity of the ſtrong ſolution * in a cold ſtate; the greateſt attention was given, but no motion could be diſcovered in the part. This experiment was then repeated on another rabbit; but the reſult was ever the ſame. I

* The ſtrong ſolution is, one drachm of opium to one ounce of water.

then laid bare the muſcles of the thorax and abdomen, and applied a conſiderable quantity of the ſame ſolution: the event proved the ſame as before; no change whatever could be diſcovered.

EXPER. VII.

HAVING laid bare the crural artery of a rabbit, I divided it, when the blood inſtantly flew out with conſiderable velocity; ſome of my ſtrong ſolution was then applied to the divided artery, the ends of which in a ſhort ſpace of time contracted, and the hemorrhagy ceaſed. The ſame experiment was performed on the brachial artery with like ſucceſs.

EXPER. VIII.

I OPENED the thorax of a rabbit, and by diſſection placed the heart in full view; the

the aorta was then divided, and the animal bled till it expired. After the heart had remained motionleſs ten minutes, and every appearance of life had ceaſed for the ſame length of time, I poured on the heart a quantity of my ſtrong ſolution; it was inſtantly thrown into motion, which continued two minutes; I then added more of the ſolution, and the action was again renewed. By thus repeating my applications, the motions of the heart were ſupported more than ten minutes. It occurred to me, after I had made this experiment, that water applied in the ſame manner would have ſimilar effects. To determine this, I put another rabbit in the ſame ſituation, and then applied a quantity of cold water to his heart. As ſoon as the firſt application was made, it was rouſed into action, but only moved five times; the ſecond application only produced one

feeble ſtroke, and no motion could be raiſed afterward by the ſame methods.

EXPER. IX.

AFTER making a ſmall opening into the abdomen of a rabbit, a quantity of my ſtrong ſolution was thrown in, and the wound cloſed to prevent the admiſſion of air. The animal remained in this ſituahalf an hour, when I opened the part, examined and found the external coats of the inteſtines and neighbouring parts much inflamed.

EXPER. X.

I OPENED the thorax of a rabbit, and, without doing any injury to the large blood-veſſels, placed the heart in view. A quantity of my ſtrong ſolution was then applied to it, which ſo accelerated the mo-

tions as to render it impoſſible to number them: By renewing the application, theſe were continued for ſome conſiderable time. The ſurface of the heart now appeared uncommonly red, and continued ſo ſome time.

EXPER. XI.

I OPENED two rabbits, and, without doing any injury to the large blood-veſſels, placed the hearts of each in view. A quantity of Volat. Alkali was then applied to the heart of one, and to the other ſome of my ſtrong ſolution. Though the greateſt attention was given to the motions of each by myſelf and friend *, no difference could be diſcovered. By renewing the applications they were continued in action ſome conſiderable time: at length

* Dr Ramſay, who witneſſed moſt of my experiments on living ſubjects.

the one to which the volatile alkali had been applied ceaſed to move; in half a minute after, the actions of the other ended; and neither could be again rouſed by any other application.

EXPER. XII.

I THREW a quantity of my ſtrong ſolution into the rectum of a rabbit, and confined the animal ſo as to have it retained half an hour: the inteſtine was then opened, and evident marks of inflammation appeared in all thoſe parts to which the ſolution had been applied.

EXPER. XIII.

I MADE one drachm of pulveriſed opium into the form of a cataplaſm, and after rubbing the inner part of a man's arm well with a flannel cloth, applied it, where it re-

remained twenty-four hours: at the end of this time I viſited the man, and inquired whether he had been unuſually affected by the application: He anſwered repeatedly in the negative. The part to which the opium had been applied, was now examined; but no marks of inflammation could be diſcovered.

EXPER. XIV.

Four drachms of pulveriſed opium were now made into a cataplaſm, and applied to the inner part of a man's thigh which had been rubbed with flannel. It remained on the part twenty-four hours; when I removed it, and inquired whether the patient had diſcovered any effects from the application; he aſſured me that the opium had produced no ſenſible operation. From theſe experiments I am led to believe, that the common received opinion reſpecting

ing the operation of opium, externally applied, muſt be erroneouſly founded; and though this opinion has been given to the world by ſome very eminent men, ſtill I feel myſelf bound to contradict it from the reſult of theſe experiments. I am led alſo to believe, that opium applied to any part protected by the common coverings of the body, can never produce any ſenſible effects, unleſs the ſenſibility of the part is much increaſed by inflammation, as in rheumatiſm and gout.

EXPER. XV.

I LAID bare the abdominal muſcles of a dog, and applied to the part ſix drachms of opium in the form of a cataplaſm. In about one hour and a half the animal began to be affected, and at the end of two hours was completely convulſed. He remained in this ſituation ſome conſiderable time;

time; and when the motions were about to ceaſe, the dog was compelled to ſwallow one ounce of opium diſſolved in water: in a ſhort ſpace of time his convulſions returned in a much more violent degree than before, and in leſs than two hours he died. I immediately opened his ſtomach, and examined the coats very attentively, but could not diſcover any marks of inflammation.

EXPER. XVI.

I DISSOLVED five grains of common opium in one ounce of water, and then with a ſyringe threw into the urethra of a man a quantity of this ſolution; but it neither produced any pain or inflammation in the part.

EXPER.

EXPER. XVII.

I DISSOLVED one drachm of opium in one ounce of water, and threw into the urethra of the ſame man a conſiderable quantity of this ſolution; he ſoon began to complain of a burning heat in the part, which he ſaid was ſevere. In two hours after this I examined the penis, and found many marks of inflammation about the orifice; this remained viſible but a ſhort ſpace of time, and was not followed by any diſcharge.

EXPER. XVIII.

I MADE ſome of the ſolution laſt uſed moderately warm, and threw a quantity of it into my own urethra; it ſoon began to operate, and gave me very ſevere pain, which laſted five minutes: the penis was

exa-

examined very attentively, but no ſymptoms of inflammation could be diſcovered externally. In half an hour after the experiment was made I attempted to paſs my urine, and felt ſome ſymptoms of heat in the urethra, but theſe were not ſevere.

EXPER. XIX.

I DISSOLVED one drachm and a half of opium in one ounce of water; and after adding to it ninety degrees of heat by thermometer, a ſmall quantity was thrown into the urethra of a man fifty years of age: in a little time he began to complain of a very ſevere pain, which continued ſeveral minutes, attended with a great degree of heat. Ten minutes after this I examined his penis, and found a conſiderable redneſs round the orifice of the urethra. He was now deſired to paſs a ſmall quantity of urine; which he effected, but not without much pain;

pain; as from his own account every ſymptom had taken place which characteriſes dyſuria.

EXPER. XX.

A QUANTITY of the ſolution laſt uſed was thrown into the vagina of a bitch; in a little time the animal began to be violently agitated, and continued ſo ſeveral minutes. As ſoon as ſhe was perfectly quiet, I examined the parts, and found that the labia were increaſed conſiderably in ſize, and the redneſs of the internal parts appeared much greater than natural. I was extremely anxious to know whether any preternatural diſcharge from the vagina would follow this experiment, but was diſappointed by an unexpected accident.

EXPER.

EXPER. XXI.

I MIXED together a quantity of cauſtic and ſtrong ſolution of opium; it was then applied to a piece of dead fleſh: the cauſtic began immediately to act, and deſtroyed the ſame quantity of fleſh as if no opium had been united with it: this was diſcovered by applying to ſome of the ſame fleſh the pure cauſtic alone. This experiment was inſtituted with a view to diſcover the propriety of the preſent prevailing opinion, which is, that opium deprives the cauſtic of its power to act on fleſh. From the reſult of this experiment, I am juſtified in ſaying, that this generally received opinion muſt be fallacious; and, like many others now entertained, which are ſaid to be the reſult of experiment, could only have received birth in the cloſet. It is well known that opium, if applied in conſiderable quantity to a part de-

deprived of its common coverings, will deſtroy its ſenſibility by acting on the nerves, and conſequently leſſen the pain ariſing from the operation of cauſtic.

EXPER. XXII.

Six grains of the pureſt reſin of opium were concealed in a piece of bread, and then given to a dog; his actions were attended to for ſix hours, but no change could be diſcovered in him. I then had him killed, and laid open the ſtomach, in which the pill was found; the ſurface was ſoft, and appeared at firſt view to have been operated upon. The pill was dried, accurately weighed, and found to have loſt one grain.

EXPER. XXIII.

I FORCED open the mouth of a rabbit,

and then introduced ten grains of the pure reſin of opium in form of a pill; a quantity of water was poured into his mouth, which conveyed the pill into the ſtomach. Finding that the animal remained undiſturbed for ſix hours, I had it killed, and opened the ſtomach, in which the pill was found; it was then dried, weighed, and found to have loſt nothing in quantity.

Theſe experiments were inſtituted with a view to diſcover certainly, whether the gaſtric fluid has any power by which it can diſſolve pure reſinous ſubſtances; from the reſult of theſe, we are authoriſed to ſay that it has no ſuch power.

EXPER. XXIV.

I mixed intimately together five grains of pure reſin of opium and ten grains of the extract of liquorice; this was forced

into the ſtomach of a rabbit in form of a pill; in leſs than ſix hours the animal ſeemed much affected: it was then killed, the ſtomach opened, and only one grain of the pill remained undiſſolved. From this experiment it appears very evident, that the extract of liquorice, when intimately combined with a pure reſinous ſubſtance, renders it ſoluble in the ſtomach.

EXPER. XXV.

To a healthy man thirty years of age, I gave two grains of the pureſt reſin of opium diſſolved in alcohol. When the doſe was given, his pulſe meaſured ſixty ſtrokes in a minute: in half an hour he complained of an unuſual heat about his ſtomach, attended with ſome affection in his head. His pulſe increaſed now twelve ſtrokes in frequency, and remained ſo five minutes;

after

after which it fell down to fifty-five, and became remarkably full and ſtrong: headach, vertigo, and drowſineſs, now came on, which continued ſevere two hours. No thirſt or increaſed perſpiration followed; the man continued coſtive forty-eight hours.

EXPER. XXVI.

FOUR days after the laſt experiment, I gave the ſame man three grains of pure reſin diſſolved in alcohol. In half an hour it began to operate, by warming his ſtomach and heart, as he obſerved, and then producing vertigo: he then obſerved that he felt as if he had taken too much whiſky. His pulſe had now increaſed three ſtrokes in frequency; but in fifteen minutes fell fourteen, and became very full and ſtrong; he complained of much languor and weakneſs for ſeveral hours after, attended with a loſs of appetite.

EXPER. XXVII.

To a healthy young man I gave four grains of the gummy part of opium diſſolved in water; in about forty minutes he began to complain of a great drowſineſs and diſpoſition to ſleep, attended with a depreſſion of ſpirits. I remained with him one hour and a half; during which time no ſymptoms, except the drowſineſs, appeared; being compelled to leave the patient, he was placed under the direction of a very intelligent man: after ſeveral hours had elapſed I returned, and received the following account: "As the patient "was ſitting in a chair, he was taken with "a violent ſickneſs at his ſtomach and con- "fuſion in his head, but no vomiting fol- "lowed: in a few minutes he fainted, and "fell on the floor, where he remained mo- "tionleſs ſome time." The man under whoſe protection I left him, had his body

and extremities well rubbed with flannel; by which he recovered, and was put to bed; but informed me that he could not ſleep, as he was diſturbed through the night by frightful dreams. His urine was conſiderably increaſed in quantity; and his thirſt, from his own account, was inſatiable. This experiment muſt convince us of the fallacy on which an opinion now prevailing is founded, viz. that the gummy part of opium, in a pure ſtate, poſſeſſes none of thoſe dangerous properties which are found in the reſin.

EXPER. XXVIII.

To a healthy young female I gave three grains of the gummy part of opium diſſolved in water; in one hour ſhe began to complain of a violent ſickneſs at her ſtomach, headach, and drowſineſs: her pulſe in ten minutes after this fell fifteen ſtrokes

in a minute, and became very full and ſtrong: ſhe remained in this ſituation one hour and a half, when all the ſymptoms diſappeared except her headach. Her appetite was ſo much injured, that ſhe could not take food for twenty-four hours.

EXPER. XXIX.

I GOT two patients into the ſame room, the one a man thirty years of age, and the other a female about twenty-five. To the man I gave five grains of the reſin of opium diſſolved in alcohol, and to the woman as much of the gum diſſolved in water. In half an hour the doſe began to operate on the man, and produced a violent ſickneſs at his ſtomach, vertigo, and head-ach: the ſickneſs at his ſtomach did not produce a vomiting, but the other ſymptoms increaſed to ſo violent a degree as to cauſe a kind of raving; from his own

ac-

account, he felt every ſymptom of drunkenneſs: his pulſe at firſt roſe ſix ſtrokes in frequency; but in fifteen minutes fell twelve, and became very full and ſtrong. Theſe ſymptoms were followed by a great thirſt and copious diſcharge of urine. It was near one hour after the woman took her doſe before it began to operate: the firſt ſymptoms ſhe complained of were a nauſea and great degree of drowſineſs; the latter increaſed to ſo great a degree that ſhe was unable to ſit up: her pulſe fell in a little time fifteen ſtrokes, and became extremely full; ſoon after getting on her bed, ſhe was affected with violent convulſions, which were relieved by the operation of a few grains of Ipecacuanha and ſixty drops of æther: ſhe continued to be affected for two days after, and her appetite was much impaired. Theſe experiments were inſtituted with a view to diſcover, whether there was any difference

in the operation of the reſinous and gummy parts of opium: from the reſult we muſt conclude, that the reſin is poſſeſſed of properties much more active than the gum.

EXPER. XXX.

To a woman fifty years of age, who had been a little accuſtomed to uſe opium, I gave ſix grains of the common kind found in the ſhops, in form of pill; in fifty minutes after ſhe had taken the doſe her ſtomach became affected, and a violent vertigo ſoon followed: from her own account ſhe now felt every ſymptom of drunkenneſs; ſhe confeſſed that ſhe had been a few days before intoxicated by the free uſe of whiſky; and ſaid, that the operation of the opium was ſimilar to that of the ſpirits. When the opium firſt began to operate, her pulſe was very irregular; in fifteen minutes after, it fell

fourteen

fourteen ſtrokes; and though very feeble before the operation of the doſe, became now extremely full: after moſt of the violent ſymptoms ceaſed, ſhe had repeated inclinations to make urine, which was often diſcharged in large quantities: her appetite continued bad for two days, attended with coſtiveneſs and general debility.

EXPER. XXXI.

Some months before I engaged in theſe experiments, my friend Dr James Ramſay from Virginia, anxious to know the effects of opium, made the following experiment on himſelf, which he communicated to me.

"Finding myſelf one night at eleven "more diſpoſed to ſleep than uſual, I "determined to try the effects of opium, "and took immediately thirty drops of the

"Theb.

" Theb. Tincture. The doſe ſoon began to
" operate, and produced ſuch enlivening
" effects as to enable me to proſecute the
" ſtudy in which I was then engaged. In
" this cheerful ſituation I remained till one
" o'clock in the morning, when I found
" a violent drowſineſs coming on, which
" in a ſhort ſpace of time increaſed to ſuch
" a degree, as to render it difficult for me
" to avoid falling to ſleep. I then took
" between ninety and one hundred drops
" of the ſame Theb. Tinct. which ſoon
" rouſed me from my drowſineſs, and in-
" vited me once more to engage in my
" buſineſs. This diſpoſition continued but
" a ſhort time: I ſoon found myſelf ſo
" exhilarated, as to grow careleſs of my
" occupation, and rather inclined to in-
" dulge in an exceſs of gaiety; which was
" gratified for ſome time by ridiculous
" exceſſes of dancing, ſinging, &c. The
" powers of my mind ſtill remained ſo

" perfect,

" perfect, as to enable me to attend to my
" conduct, and to examine the ſtate of my
" pulſe, which was ſtrong and full; but
" not having a proper watch, could not
" aſcertain its frequency. Theſe ſymp-
" toms ſoon increaſed to ſo violent a de-
" gree as to alarm me; the pulſations of
" the temporal arteries became uncom-
" monly ſtrong, and every object appeared
" multiplied and covered with a miſt.
" At this moment I aroſe from my ſeat;
" but ſoon found myſelf unable to walk,
" as my legs felt much lighter than uſual:
" with much difficulty I reached the
" window and hoiſted it, expecting to
" be relieved by the freſh air; but in
" this was diſappointed, as the vertigo
" ſeemed much increaſed by it. I now
" with the utmoſt difficulty undreſſed my-
" ſelf and got to bed, where I remained
" almoſt motionleſs, being unable to move
" my limbs: my imagination was ſo di-
" ſtreſſed

" ſtreſſed by the appearances of horrid
" images, that I could not cloſe my eyes
" till ſeven, when I fell into an interrupted
" ſlumber. At ten I roſe from my bed;
" and finding myſelf much debilitated,
" and inclined to vomit, took thirty drops
" more of the Theb. Tinct. which ſo far
" removed my complaints as to enable me
" to dreſs: my appetite was ſo much in-
" jured, that I could eat no breakfaſt, drank
" only a diſh of tea, and then went out
" to purſue my daily occupations. After
" expoſing myſelf for ſome little time,
" grew ſick at my ſtomach, and threw up
" a quantity of bilious matter. About
" twelve my appetite returned, when I
" eat a ſalt herring, and drank a bottle of
" porter. From this time continued well
" till three in the evening, when the ſick-
" neſs at my ſtomach returned, which
" was removed by a glaſs of rum and
" water. At ſeven I went to the play-
" houſe,

" houſe, where I remained only a ſhort " ſpace of time, the heat being ſo violent " as to cauſe a return of all the dangerous " ſymptoms: was then carried to my " lodgings, where I was ſeized with con- " vulſions; which my phyſician informed " me were relieved by warm applications " to my extremities and a doſe of muſk."

EXPER. XXXII.

To an healthy young man I gave two ounces of the commonvegetable acid; in fifteen minutes after, he took eighty drops of Theb. Tinct. I remained with him two hours. Juſt before my departure he complained of a little nauſea and headach: theſe ſymptoms, as he informed me, continued but a ſhort ſpace of time; and when they were removed, he felt himſelf as uſual, except a little ſickneſs about his ſtomach. I attended very particularly to his

his pulſe, but could diſcover no change in it.

EXPER. XXXIII.

I GAVE a boy, twelve years of age, one ounce of common vinegar, and in fifteen minutes after forty drops of Theb. Tinct. In half an hour it produced a ſevere ſickneſs at his ſtomach, but no vomiting; his head now began to be a little affected, but did not continue ſo long; his pulſe remained ſteady, except when the nauſea appeared; at that moment was irregular. Theſe ſymptoms ſoon went off, and the boy was reſtored to his uſual ſituation. Experiments ſimilar to theſe were made on dogs and rabbits; the opium was ſeldom found to have much effect, if an acid had been previouſly given.

From experiments like theſe muſt have ariſen the opinion which led ſome to be-

lieve, that acids, adminiſtered after a large doſe of opium, though it had operated, would correct the dangerous properties of that remedy: to this I cannot ſubſcribe; for to me it appears evident, that the acid can only have the power of rendering the nerves of the ſtomach, upon which it acts as well as the opium, inſenſible to the operation of that remedy: this the acid cannot effect after the opium has operated. To ſatisfy myſelf fully on this ſubject, I made ſeveral experiments on frogs and dogs; and found, that the acid, if given after the opium began to operate, had not the ſmalleſt power of correcting its dangerous properties*.

EXPER.

* Dr Webſter, in his Syllabus, has the following obſervation: "Acids render the ſtomach leſs capable "of being acted upon by other matters, as ſpirits, ale, "&c." The Doctor in his lectures extends this obſer- "vation, by ſaying, that the actions of hemlock, opi- "um, and ipecac. are moderated much by the addition "of an acid."

EXPER. XXXIV.

To four men, whoſe ages and conſtitutions appeared to be nearly ſimilar, I gave the following quantities and forms of opium, viz. to the firſt, I gave two grains of the pureſt reſin of opium diſſolved in alcohol; to the ſecond, the ſame quantity of pure gum diſſolved in water; to the third, forty drops of Theb. Tinct. and to the fourth, the ſame quantity of Theb. Tinct. heated to the degree of ninety by thermometer. The reſin began to operate in twenty-eight minutes, and produced the common ſymptoms. The gum began to operate in fifty-five minutes; the Theb. Tinct. in a cold ſtate, in thirty-eight minutes; and that to which the heat had been applied, in thirty-two minutes. Theſe experiments were repeated the day following on the ſame perſons; and though I

muſt

muſt confeſs that they did not agree exactly with the firſt; yet the difference was ſmall, and the reſin diſſolved in alcohol ever diſcovered its action firſt.

As theſe experiments were inſtituted with a view only to diſcover the time in which the different forms of the opium would operate, I did not ſuppoſe it neceſſary to attend to the different ſymptoms, and particularly as experiments for this purpoſe have been already related.

If we are at liberty to judge from theſe experiments, it muſt appear evident, that the reſinous part of opium, when diſſolved in alcohol, has the power of producing its action much ſooner than the other preparations of that remedy. This muſt either lead us to ſuppoſe that the reſin poſſeſſes moſt of the active parts of the opium; or that its menſtruum, alcohol, aſſiſts in pro-

ducing its ſpeedy operation. It ſeems evident alſo, that by the addition of heat, the Theb. Tinct. is enabled to produce its effects much ſooner than in the common form.

Theſe experiments may perhaps at firſt view appear better calculated to pleaſe the curious mind than to afford real utility; but I am led to believe, that when they are attentively inveſtigated, we ſhall eaſily diſcover their benefits. It is well known to all phyſicians, that many diſeaſes occur in which it is neceſſary to procure the operation of an opiate as ſoon as poſſible: It is in theſe caſes, then, that the advantages of theſe experiments will diſcover themſelves.

Such are the experiments which I have inſtituted for aſcertaining the effects and the virtues of opium. It might be expected,

ted, that, after theſe, I ſhould proceed to give my opinion concerning the operation of this excellent remedy; but many reaſons diſſuade me from entering at all into a diſcuſſion of this point. This ſubject has of late occupied the attention of moſt medical men; and various opinions with regard to it have been brought forth and ſupported by writers of the higheſt eminence. The author of this Treatiſe is too ſenſible of his own weakneſs and inſufficiency to obtrude upon the world any ſpeculations ſupported merely by his ſlender authority; and eſpecially in a ſubject upon which ſo much has been ſaid, that to ſay more would perhaps only tend to render more perplexed what of itſelf is already ſufficiently intricate, and to involve in greater darkneſs an inquiry which clouds of authors have already obſcured. The reader of this Treatiſe, it is therefore hoped, will pardon the Author for not en-

tering into a ſubject thus darkened by the ſhades of controverſy; and where both might thus bewilder themſelves, and be loſt in the ſurrounding gloom.

Inſtead, therefore, of venturing upon an inquiry ſo hazardous, ſo difficult, and ſo full of conjecture; inſtead of committing himſelf in a conteſt with any writer by broaching any general theory whatever; the Author has thought it ſafer, and by far the moſt eligible mode, to detail with accuracy and preciſion thoſe experiments which he made with the greateſt care, and from which every impartial man may deduce ſuch concluſions as the experiments themſelves ſhall appear to warrant. He has produced facts for which he can vouch; the reſult of theſe facts he leaves with a diſcerning public. Their real value and conſequence will be the better perceived, from their being naked and deſtitute of all arti-

artificial gloſs, of all adventitious decoration. And the higheſt wiſh of the Author will be gratified, if his induſtry ſhall have furniſhed the materials upon which the ingenuity of other men may erect what he himſelf is cautious of rearing.

ON THE

USES OF

OPIUM.

AS the operation of opium has for ſome time paſt been the ſubject of much diſpute, the attention of moſt medical men has been naturally called forth to this remedy; hence it has been recommended in ſo many different diſeaſes, that to enumerate theſe would exceed the limits of this Treatiſe. Such, therefore, alone will be men-

mentioned as ſeem moſt particularly to require this remedy. But before theſe are detailed, it will be proper to introduce the opinions of the ancients reſpecting the operation of opium, and the forms in which they uſed it: as they had no favourite theories to ſupport, we ſhall find their concluſions deduced from undoubted facts.

In Chardin's travels through Perſia, we find the following obſervations: "The "free uſe of opium among the Perſians "appears to have been introduced to al- "lay the uneaſineſs and troubles of old "men in great places, who were forbid "the uſe of wine by Mahomet. They "have ſeveral preparations of the poppy "which they uſe for this purpoſe; the "firſt is the juice of the poppy itſelf, which "they uſe in form of a pill of the bigneſs "of a pin's head at firſt, and then gra-

" dually increaſe it to the ſize of a pea;
" in one hour's time they begin to feel
" its effects. The Perſians ſay it enter-
" tains their fancies with pleaſant viſions,
" and a kind of rapture; they very ſoon
" grow merry, then burſt into a laugh,
" which continues till they die away in a
" ſwoon. It is found by thoſe who have
" a diſpoſition for jeſting, to increaſe that
" extremely. After the operation of this
" remedy, the body grows cold, penſive,
" and heavy; in this dull and indolent
" ſituation it remains till the doſe is re-
" peated. Thoſe of the Perſians who are
" accuſtomed to uſe this remedy cannot
" live without it; the want of it produces
" depreſſion of ſpirits, and a languor and
" debility are inſtantly diſcovered in the
" countenance. The Turks ſay they can-
" not live without opium, unleſs wine is
" given them in its place; and even then
" they are not content, as they ſay that

wine

" wine does not operate ſo powerfully on " them as opium."

It is ſaid by ſome writers *, that among many of the Turks opium is uſed to the quantity of ten drachms in the day. Kerr obſerves, that it is the cuſtom of the Chineſe to ſmoke opium in their pipes in the place of tobacco; and this they do becauſe it produces a livelineſs in them. Chardin mentions the following circumſtances: " When a Perſian finds himſelf in a diſ- " treſſed ſituation, he has recourſe to a " piece of opium as big as his thumb, and " immediately after taking this he drinks a " glaſs of vinegar; this throws him into a " fit of laughter and every extravagancy " of mirth, which terminates in death: " hence this common ſaying among them, " *When you are wearied with life, have re-* " *courſe to opium and vinegar, and then you* " *die*

* Garcias.

" *die merrily.* There is a decoction which
" is made of the ſhells and ſeeds of the
" poppy, this the Perſians call Locquenor;
" they ſell it publicly in all their cities as
" they do coffee: it is curious to obſerve
" the countenances of thoſe who uſe this
" decoction, before its operation, and when
" its effects have taken place. When they
" come into the decoction-houſe, they are
" dull, pale, and languid; but as ſoon as
" the remedy begins to operate, they are
" quite changed: they run into all the ex-
" travagancies of mirth and laughter, and
" ſuch an uproar is produced, that it would
" be more proper to give it the name of
" the Mad-houſe than Decoction-ſhop.
" From theſe effects of opium the Perſians
" call it a Rapture, and maintain that there
" is a ſupernatural and divine impulſe in
" that frame of mind which opium pro-
" duces."

It is obſerved in the hiſtory of Egypt, that the bakers in that country ſprinkle the ſeeds of poppies upon their bread, becauſe it is a provocative to ſleep; and the lower claſs of people eat the ſeeds. Ruſſell, in his Hiſtory of Aleppo, has given the following remarks on the uſe of opium among the Turks. "Opium is not ſo "highly eſteemed by the inhabitants of "Aleppo as thoſe of Conſtantinople and "ſome other places; nor could I ever find "it ſo generally taken in Turky as is com-"monly apprehended, it being chiefly "confined to the debauchees. They who "take it in large quantities are called Te-"reakys, from the term Theriaca Andro-"machi, which perhaps may countenance "a conjecture, that this was the original "form in which they uſed it: At preſent, "they not only uſe it in that form, but "have various other electuaries or confec-"tions wherein it is mixed with aroma-

"tics.

" tics. Some few uſe it pure; and the " greateſt quantity I ever knew taken was " three drachms in twenty-four hours. " The immediate effect that I obſerved it " to have upon ſuch as were addicted to " its uſe, was, that their ſpirits were exhi- " larated; and from a dozing depreſſed " ſtate, they became active and alert. The " conſequences of a long uſe of it are, " that they ſoon look old and emaciated, " like ſuch as, in Europe, have ruined their " conſtitutions by hard drinking."

How the benefits of opium were diſcovered in certain diſeaſes, ſeems rather difficult to explain: but certain it is, that this remedy has been long ſince uſed in intermittent fevers; and ſome very old writers * depended wholly on this remedy for a cure. † Many have adviſed it to be given

* Schulz, Dalberg.

† Paracelſus, Etmuller, and others.

given before the hot ſtage, or at the moment of its appearance; by which, it is ſaid, the diſeaſe has often been removed. ‡ Others are of opinion, that it ſhould be adminiſtered one hour before the hot ſtage; by which the paroxyſm is ſhortened, and the patient freed from pain. From ſome very late experiments, it is found, that given in the hot ſtage, opium, as well as volatile alkali, has been obſerved to allay the heat, thirſt, head-ach, and delirium; to induce ſweat and ſleep; to cure the diſeaſe with the leſs bark, and without leaving abdominal obſtructions or dropſy.

These effects, perhaps, firſt ſuggeſted its uſe in typhous fevers; and we find that many phyſicians of the higheſt eminence depend now principally on this remedy for a cure. Dr Cullen, in his Materia Medica, obſerves, that opium may be uſed in this

‡ Murray.

this diſeaſe as a ſtimulant, becauſe the vis vitæ is very low; but when the remiſſions are diſtinct, it ſhould then be adminiſtered as a ſedative.

THE danger which phyſicians formerly apprehended from the uſe of this remedy ſeems now to have vaniſhed; and facts are not wanting to prove, that even the moſt cautious have of late adminiſtered it in the latter ſtage of typhous fevers, in form of Theb. Tinct. to the quantity of eighty drops, three times in twenty-four hours. The great ſucceſs attending this practice, has not only rendered it very common, but eſtabliſhed opium as one of our moſt valuable remedies in theſe diſeaſes.

THE propriety of uſing opium in the gout, has of late produced ſome contentions among phyſicians. Some very eminent men conſider this as a diſeaſe of a

highly inflammatory nature, and conſequently forbid the uſe of opium: others of equal eminence teach us, that the diſeaſe depends upon debility, and can only be removed by ſtimulant remedies; among which they conſider opium the moſt powerful. Many unequivocal caſes have of late been brought, which prove, that the gout has been effectually cured by opium adminiſtered in large doſes at the firſt attack of the diſeaſe.

To Sydenham we are indebted for the diſcovery which proves, that opium is one of our moſt valuable remedies in the ſmall-pox. This author has very juſtly obſerved, that it promotes a free ſuppuration, increaſes the ſalivation, and all other ſecretions which have been found ſo very ſerviceable in this diſeaſe: even in thoſe caſes where there appeared to be a determination to the brain and delirium, he adminiſtered

niſtered opium till he had removed the ſymptoms. When the convulſions before eruption are conſiderable, portending the confluent or typhous kind, opium and wine are conſidered as the principal remedies from which we are to expect relief.

THE benefits ariſing from the uſe of opium in phthiſis pulmonalis, or conſumption of the lungs, ſeems not to be a diſcovery peculiar to the preſent age; in the works of Van Swieten we find the following obſervations: "Opium in this diſ-
"eaſe is a very excellent remedy, becauſe
"it alleviates pain and cough, produces
"ſleep, and ſo refreſhes the patient; it alſo
"checks the motions of the lungs, and ſo
"gives the ulcers an opportunity to heal."
In the writings of Theoph. de Meza, ſeveral caſes are related, where opium was found to cure this diſeaſe in its incipient ſtate. I witneſſed a cure of incipient

phthiſis a few months paſt, in which opium was given from three to ſix grains in twenty-four hours, and with the beſt ſucceſs.

MANY men * of the greateſt eminence forbid the uſe of opium in dyſentery before evacuants have been adminiſtered; becauſe, from its tendency to produce coſtiveneſs, it retains the feces, which thus become a ſource of irritation to the inteſtines. The practice adopted by moſt of theſe is, to evacuate the inteſtines by a gentle purgative, and then to adminiſter ſmall doſes of opium. Some † are of opinion, that opium is moſt ſerviceable in this diſeaſe combined with Ipecacuanha: Others ‡ adviſe it to be united with gentle

K purga-

* Wepfer, Bontius, Sydenham, Pringle, Young, Zimmerman.

† Pringle.

‡ De Haen, Young.

purgatives. An opinion, very different from thoſe juſt mentioned, is now entertained by phyſicians high in eſtimation. They ſuppoſe, that dyſentery depends on debility, affecting the inteſtinal canal particularly; and recommend the free uſe of opium and wine previous to any evacuations: by this practice, we are told, that the tormina and teneſmus, ſo common to this diſeaſe, are quickly removed.

The uſe of evacuants previous to that of opium is not ſo generally recommended in diarrhœa as in dyſentery: many phyſicians adminiſter this remedy freely at the firſt attack of the diſeaſe; and the ſucceſs attending ſuch a mode of practice can but render it more common. The violence of thoſe ſymptoms common to cholera forbids the uſe of evacuants. Hence moſt phyſicians in warm climates, where this diſeaſe is moſt frequent, have found

found it neceſſary to remove theſe as ſpeedily as poſſible: for this purpoſe, they adminiſter opium in form of Theb. Tinct. from twenty to eighty drops at the firſt attack of the diſeaſe; and the good effects ariſing from this treatment has now rendered it very general.

Opium, combined with laxatives, is generally adminiſtered in colic; and is ſaid ſaid to prevent ileus and inflammation by relieving the ſpaſm. In ileus and incarcerated hernia, it is often found to allay the vomiting, the ſpaſms, the pain, and ſometimes to diminiſh the inflammation, and prevent the gangrene of the ſtrangulated gut.

In no diſeaſe has opium been more generally recommended than in tetanus; and many phyſicians* have depended upon this

* Silveſter, Clephane,

remedy ſolely for a cure. Chambers of South Carolina adviſes the opium to be given in form of clyſter, or combined with oil, and applied externally to the part: Hillary directs it to be united with muſk; which he ſays haſtens the operation, and has been found to produce the beſt effects. Some very late and accurate obſervers* have found that opium is but little calculated to effect a cure in this dangerous diſeaſe. In a work called Practical Remarks on Weſt India Diſeaſes, we find mention is made of a caſe where thirty ounces of laudanum were given in a ſhort ſpace of time without removing the ſpaſm or pain attending this diſeaſe. Mr John Hunter mentions a number of caſes in which he gave opium in very conſiderable quantities both internally and externally, without the ſmalleſt benefit. Many caſes of tetanus occurred ſome few months ſince in the

* Mr John Hunter.

the hoſpitals at London; for the relief of which, opium was adminiſtered in large doſes and frequently repeated, but without any good effects. From theſe circumſtances I am led to believe, that phyſicians have hitherto depended too much on this remedy for a cure; and though I am unable to point out one more efficacious, ſtill it appeared neceſſary to ſhow the fallacy of our preſent practice in this diſeaſe.

Whether opium is calculated to remove ſyphilis, has now become a ſubject of diſpute among phyſicians. Some are of opinion that it acts merely as a palliative, by quieting the ſymptoms only for a time. There are others * of great eminence who have endeavoured to eſtabliſh this as the only remedy neceſſary to remove this diſeaſe; and many unequivocal caſes are related, where opium in doſes, gradually in-

* Dr Webſter.

creaſed to five grains, three, four, or even ſix times a-day, has produced a cure. That it is highly beneficial after the free uſe of mercury, appears very evident from the number of caſes related by Mr Grant in the London Medical Journal for 1785.

The danger which many apprehended from the uſe of opium in ophthalmia, ſeems now to have been removed by a very valuable publication offered the world by Mr Ware. This writer relates a number of caſes where opium, in the form of Theb. Tinct. has given relief after other remedies had been unſucceſsfully uſed.

Some few caſes are related where opium has been found very ſerviceable in dropſy. In Dr Willis's Pharmacopœia Ration. the caſe of a patient is mentioned, who laboured under aſcites attended with ana-

ſarca, which was removed by Liquid Laudanum.

It is found to afford much relief to the various ſpaſmodic ſymptoms of dyſpepſia, hyſteria, hypochondriaſis, aſthma, &c. &c.

Having now communicated the whole of my obſervations, it only remains to apologiſe for the manner in which I have conducted myſelf in the laſt part of this work. From a firſt examination the Reader may perhaps be led to cenſure the Author for the ſuperficial view he has taken of thoſe diſeaſes in which opium is uſed; but when it is conſidered that limits were fixed to this Treatiſe beyond which the Author could not go, and that to inveſtigate fully and accurately the various diſeaſes in which opium is recommended would require for itſelf a ſeparate

treatise, he hopes that this omission will be readily excused.

The many marks of friendship and attention which I have received from Dr Duncan during my residence in Edinburgh, call loudly for acknowledgments; and demand that I should seize this my first opportunity to return him thus publicly my most sincere thanks. Nor am I less sensible of the obligations under which I am placed by the services of Dr Webster, from whose private assistance, as well as public lectures, I have derived the greatest benefits.

FINIS.

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